UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON, D.C. 20460

OFFICE OF
PREVENTION, PESTICIDES
AND TOXIC SUBSTANCES

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MEMORANDUM

SUBJECT: **Sulfometuron Methyl:** Occupational and Residential Exposure Assessment for the Reregistration Eligibility Decision (Non-Food).

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DP Barcode: D345025

Pesticide Chemical Code: 122001

ExpoSAC Review Date: 10/11/07; Kelly O'Rourke, Seyed Tadayon

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Executive Summary

Sulfometuron methyl is a non-selective, sulfonyl urea herbicide. It is labeled for commercial pre- and post-emergent applications to manage annual and perennial broadleaf weeds and grasses in non-agricultural sites (i.e., forestry, rights of way, industrial sites, and unimproved turf). Based upon the 11/28/2006 sulfometuron methyl SMART meeting, there are no registered uses for sites which could be considered residential or recreational settings. While labeled use sites of sulfometuron methyl include turf (unimproved) and non-crop industrial, label language prohibits application to these sites in residential and recreational areas. According to the OPPIN Database, there are currently a total of 24 registered products of which 4 are technical or manufacturing concentrate formulations. Applications ranging from 0.03 to 0.38 pound of active ingredient (ai) per acre may be made using ground or aerial equipment. All registered sulfometuron products are formulated as water dispersable granules (WDGs).

Hazard Concerns

The dermal and inhalation endpoints were selected from a chronic oral study in dogs (1983, MRID No.: 129051) since the 21-day dermal rabbit study was determined to be insufficient to assess dermal exposures due to a number of deficiencies and no route specific study was available for inhalation toxicity. With chronic oral exposure, signs of hemolytic anemia were observed in dogs and body weight effects were seen beginning on week 4 (and persisting throughout the entire study) of repeated exposure. Although no hematological or clinical chemistry assessments are available at the 4-week interval, the decreases in body weight gain noted beginning on the fourth week of the study provide an appropriate endpoint for short-term risk assessment. Since the hematological effects noted at the end of the study occurred at the same dose level as the body weight gain decrements seen beginning on the fourth week of exposure, this study and endpoints are also appropriate to assess potential intermediate- and long-term risks due to sulfometuron methyl exposure.

Occupational Handler Exposure/Risk

Short- (up to 30 days) and intermediate-term (30 days to 6 months) dermal and inhalation exposures/risks were calculated for occupational handlers of sulfometuron methyl for different exposure scenarios. Long-term handler exposures (greater than 6 months) are not expected to occur. All but one of the occupational handler short- and intermediate-term scenarios assessed (dermal and inhalation combined) resulted in risk estimates (MOEs) $\geq$ 100 at some level of personal protection and, therefore, are not of concern. The exposure scenario mixing/loading WDGs for aerial application to forestry and non-crop areas results in a combined MOE = 90 at the maximum level of personal protection (double layer with gloves) and, therefore, is of potential concern. However, this concern is significantly reduced because of the use of conservative inputs in the risk estimates (e.g., 100% dermal absorption).

Occupational Postapplication Exposure/Risk

An occupational postapplication assessment of exposure to sulfometuron methyl was not performed. Since sulfometuron methyl is a non-selective herbicide used in non-agricultural areas, HED has determined that contact with previously treated areas is likely to be insignificant.

Residential Handler and Postapplication Exposure/Risk

Residential exposure/risk (handler and postapplication) was not assessed since label instructions do not allow applications of sulfometuron methyl to residential or recreational settings.

1.0 Occupational Exposure/ Risk Assessment

1.1 Criteria for Conducting Exposure Assessments

An occupational and/or residential exposure assessment is required for an active ingredient if (1) certain toxicological criteria are triggered and (2) there is a potential for exposure to handlers during use or to persons entering treated sites after application is complete. Sulfometuron methyl meets the first criterion based upon the potential for exposure to occupational handlers of sulfometuron methyl.

1.2 Toxicological Endpoints

The toxicology database for sulfometuron methyl is limited, but sufficient to provide screening level endpoints for this non-food/non-feed pesticide. Sulfometuron methyl is not acutely toxic. The acute oral LD_{50} in rats is > 5 g/kg (Toxicity Category IV), the acute dermal LD_{50} is > 2 g/kg (Toxicity Category III), and the acute inhalation LC_{50} > 5.0 mg/L (Toxicity Category IV). Sulfometuron methyl shows minimal eye irritation and minimal skin irritation, but is not considered a dermal irritant or dermal sensitizer. The acute toxicity for sulfometuron methyl is presented in Table 1. The toxicological endpoints used to complete the occupational exposure assessment are summarized in Table 2.

Table 1. Acute Toxicity Profile – Sulfometuron Methyl[1]

Guideline No.	Study Type	MRID(s)	Results	Toxicity Category
870.1100	Acute oral - rat	43089201	LD_{50} = > 5000 mg/kg	IV
870.1200	Acute dermal [species]	43089202	LD_{50} = > 2000 mg/kg	III
870.1300	Acute inhalation – rat	43089203	LC_{50} = > 5 mg/L	IV
870.2400	Acute eye irritation [species]	00071412	Minimal Irritant	III
870.2500	Acute dermal irritation [species]	41672808	Not a Dermal Irritant	IV*

Table 1. Acute Toxicity Profile – Sulfometuron Methyl[1]				
Guideline No.	**Study Type**	**MRID(s)**	**Results**	**Toxicity Category**
870.2600	Skin sensitization [species]	43089204	Not a Dermal Sensitizer	N/A

[1] All studies were conducted on technical grade Sulfometuron methyl, of at least 98.8%, purity.
* Minimal skin irritation was noted in the acute dermal toxicity study (MRID 43089202) and an older dermal dermal irritation study of a 75% formulation (MRID 00071411)

Table 2. Summary of Toxicological Doses and Endpoints for Sulfometuron Methyl for Use in Occupational Human Health Risk Assessments				
Exposure/ Scenario	**Point of Departure**	**Uncertainty Factors**	**Level of Concern for Risk Assessment**	**Study and Toxicological Effects**
Dermal and Inhalation Short- (1-30 days) and Intermediate-Term (1-6 months) (no residential uses)	NOAEL= 27.5 mg/kg/day	UF_A=10x UF_H=10x	MOE = 100	Chronic 1-year dog study LOAEL = 148.5 mg/kg/day based on decreases in body weight in males (beginning on the fourth week of exposure and persisted throughout), hemolytic anemia and a slight increase in alkaline phosphatase in males and females
Cancer (oral, dermal, inhalation)	No data available for assessment			

UF = uncertainty factor. UF_A = extrapolation from animal to human (intraspecies). UF_H = potential variation in sensitivity among members of the human population (interspecies). MOE = margin of exposure.

1.3 Incident Report

The incident report was incomplete at the time of document submission (please see R.H. Allen, M. Hawkins & H. Allender, D343943).

1.4 Summary of Use Patterns, Formulations and Application Methods

Sulfometuron methyl is a nonselective herbicide labeled for pre- and post-emergent applications to manage annual and perennial grasses and broadleaf weeds. All sulfometuron methyl products are formulated as WDG (ranging from 18 to 75% ai) and are directed to the target via liquid spray applications via aerial or ground application methods. Registered uses of sulfometuron methyl include:

- forestry (conifers, hardwoods, hybrid poplar plantations);
- non-crop industrial sites (public, private, and military lands, rights-of-way, under asphalt and concrete);
- turf (unimproved); and
- non-crop habitat restoration sites.

Mode of Action and Targets Controlled

Sufometuron methyl acts by inhibiting acetolactate synthase (ALS), an enzyme that catalyzes the biosynthesis of three branched-chain amino acids (valine, leucine, and isoleucine), all of which are essential for plant growth.

Formulation Types and Percent Active Ingredient

A listing of registered sulfometuron methyl products are summarized below in Table 3. All products are formulated as WDGs.

Table 3. End-Use Product Formulations and EPA Reg. Number

Formulation Type	Number of Products	EPA Registration Number (Percent Active Ingredient)
WDG	20	352-401 (75%), 352-408 (75%), 352-601 (75%), 352-603 (63.2%), 352-620 (56.3%), 352-621 (50%), 352-622 (56.3%), 352-626 (68.6%), 352-645 (50%), 352-647 (56.3%), 352-712 (18%), 352-725 (18%), 66330-326 (75%), 53883-164 (75%), 74477-7 (75%), 74477-11 (56.3%), 79676-16 (75%), 81927-5 (56.3%), 81959-2 (75%), 81959-15 (56.3%)
Technical/ Manufacturing Product	4	352-554 (97.6%), 66330-322 (99%), 74477-3 (99%), 81959-1 (99%)

Application Rates, Timing and Frequency of Applications

Application rates of sulfometuron methyl range from 0.03 to 0.38 pound of active ingredient (ai) per acre. Control is generally for a full season or longer with only one required application per year; however, in some situations (i.e., weed escapes) a second application may be made, but the total applied annually should not exceed the maximum application rate.

Application Methods

Applications of sulfometuron methyl can be made aerially (helicopter and fixed-wing airplane) or by ground (high and low pressure handwand, groundboom, and rights-of-way sprayer). Low pressure handwand applications are typical for selective foliar applications (applied to target vegetation), while aerial, groundboom, and rights-of-way applications are specific to wide-area, broadcast treatments.

2.0 Occupational Exposure/ Risks

It has been determined there is a potential for exposure in occupational scenarios from handling sulfometuron methyl products during the application process (i.e., mixer/loaders, applicators, flaggers, and mixer/loader/applicators). A risk assessment has

been completed for the occupational handling of sulfometuron methyl; however, an occupational postapplication assessment of exposure to sulfometuron methyl was not performed. Since sulfometuron methyl is a non-selective herbicide used in non-agricultural areas, HED has determined that contact with previously treated areas is likely to be insignificant.

2.1 Occupational Handler Exposure/Risks

The Agency uses the term "handlers" to describe those individuals who are involved in the pesticide application process. The Agency believes that there are distinct tasks related to applications and that exposures can vary depending on the specifics of each task. Job requirements (e.g., the amount of chemical to be used in an application), the kinds of equipment used, and the target being treated can cause exposure levels to differ in a manner specific to each application event.

The first step in the handler risk assessment process is to identify the kinds of individuals that are likely to be exposed to sulfometuron methyl during the application process. In order to do this in a consistent manner, HED has developed a series of general descriptions for tasks that are associated with pesticide applications. Tasks associated with occupational pesticide use (i.e., for "handlers") can generally be categorized using one of the following terms:

- **Mixers and/or Loaders:** these individuals perform tasks in preparation for an application.

- **Applicators:** these individuals operate application equipment during the release of a pesticide product into the environment.

- **Flaggers:** these individuals guide aerial applicators during the release of a pesticide product onto an intended target.

- **Mixer/Loader/Applicators:** these individuals are involved in the entire pesticide application process (i.e., they do all job functions related to a pesticide application event).

Next, assessors must understand how exposures to sulfometuron methyl occur (i.e., frequency and duration) and how the patterns of these occurrences can cause the effects of the chemical to differ (referred to as dose response). Wherever possible, use and usage data determine the appropriateness of certain types of risk assessments. Other parameters are also defined from use and usage data such as application rates and application frequency. HED always completes non-cancer risk assessments using maximum application rates for each scenario because what is possible under the label (the legal means of controlling pesticide use) must be evaluated in order to ensure there are no concerns for each specific use.

HED believes that occupational sulfometuron methyl exposures can occur over a single

day or up to weeks at a time for many use-patterns and intermittent exposures over several weeks are also anticipated. Custom or commercial applicators may apply sulfometuron methyl over a period of weeks completing applications for a number of different clients. HED classifies exposures up to 30 days as short-term and exposures greater than 30 days up to several months (6) as intermediate-term. Based upon the use pattern of sulfometuron methyl, HED anticipates both short- and intermediate-term occupational exposure. Long-term handler exposures (greater than 6 months) are not expected to occur. The dermal and inhalation endpoint selected for sulfometuron methyl is for short- and intermediate-term durations of exposure.

2.1.1 Data and Assumptions for Handler Exposure Scenarios

Assumptions for Handler Exposure Scenarios

A series of assumptions and exposure factors served as the basis for completing the occupational handler risk assessments. The assumptions and factors used in the risk calculations include:

- HED has patterned this risk assessment on a series of likely representative scenarios that are believed by HED to represent the vast majority of sulfometuron methyl uses;

- Average body weight of an adult handler is 70 kg because the toxicity endpoint values used for the assessments are appropriate for average adult body weight representing the general population;

- For non-cancer assessments, HED assumes the maximum application rates allowed by labels in its risk assessments;

- Since no dermal absorption data are available, a default 100% absorption factor is assumed;

- The average occupational workday is assumed to be 8 hours; and

- The daily areas treated were defined for each handler scenario (in appropriate units) by determining the amount that can be reasonably treated in a single day (e.g. acres, square feet, or gallons per day). The assumptions for daily areas treated are taken from the HED ExpoSAC SOP #9: Standard Values for Daily Acres Treated in Agriculture which was completed on July 5, 2000.

    - Aerial Applications for Forestry – 1200 acres
    - Groundboom Applications – 200 acres
    - Flaggers – 350 acres
    - Right-of-Way Sprayer – 25 acres (based upon 1000 gallons/day, as specified by SOP #9, and a labeled rate of 40 gallons/acre)
    - Low Pressure Handwand Sprayer – 1 acre (based upon 40 gallons/day, as

specified by SOP #9, and a labeled rate of 40 gallons/acre)

Data for Handler Exposure Scenarios

No chemical specific information was available for sulfometuron methyl handler exposure assessments. All analyses were completed using acceptable surrogate exposure data for the scenario in question.

HED uses a concept known as unit exposure as the basis for the scenarios used to assess handler exposures to pesticides. Unit exposures numerically represent the exposures one would receive related to an application. They are generally presented as mg active ingredient exposure/pounds of handled (mg ai/lb). HED has developed different unit exposures for different types of application equipment; job functions; and levels of protection. The unit exposure concept has been established in the scientific literature and also through various exposure monitoring guidelines published by the U.S. EPA and international organizations such as Health Canada and OECD (Organization for Economic Cooperation and Development). All unit exposure values used to assess occupational handler exposure/risk are presented in Appendix A at the end of this document.

Pesticide Handler Exposure Database (PHED) Version 1.1 (August 1998):
PHED was designed by a task force of representatives from the US EPA, Health Canada, the California Department of Pesticide Regulation, and member companies of the American Crop Protection Association. PHED is a software system consisting of two parts – a database of measured exposure values for workers involved in the handling of pesticides under actual field conditions and a set of computer algorithms used to subset and statistically summarize the selected data. Currently, the database contains values for over 1,700 monitored individuals (i.e., records). The distribution of exposure values for each body part (e.g., chest, upper arm) is categorized as normal, lognormal, or "other" (i.e., neither normal nor lognormal). A central tendency value is then selected from the distribution of the exposure values for each body part. These values are the arithmetic mean for normal distributions, the geometric mean for lognormal distributions, and the median for all "other" distributions. Once selected, the central tendency values for each body part are composited into a "best fit" exposure value representing the entire body.

The unit exposure values calculated by PHED generally ranges from the geometric mean to the median of the selected data set. To add consistency and quality control to the values produced from this system, the PHED Task Force has evaluated all data within the system and has developed a set of grading criteria to characterize the quality of the original study data. The assessment of data quality is based upon the number of observations and the available quality control data. While data from PHED provide the best available information on handler exposures, it should be noted that some aspects of the included studies (e.g., duration, acres treated, pounds of active ingredient handled) may not accurately represent labeled uses in all cases. HED has developed a series of tables of standard unit exposures for many occupational scenarios that can be used to ensure consistency in exposure assessments.

Review of Human Research

This risk assessment relies in part on data from studies in which adult human subjects were intentionally exposed to a pesticide or other chemical. The studies which compose PHED were determined to require a review of their ethical conduct, have received that review and have been determined to be ethical.

2.1.2 Sulfometuron Methyl Handler Exposure Scenarios

Exposure to pesticide handlers is likely during the occupational use of sulfometuron methyl based on the types of equipment and techniques that can potentially be used. The quantitative exposure/risk assessment developed for occupational handlers is based on the following scenarios. Sulfometuron methyl dermal and inhalation exposure was estimated using PHED data. Mixer/loader exposure scenarios were estimated using PHED data specific to dry flowable (DF) products since this formulation is most similar to WDGs; however, all other tasks (i.e., applicators, flaggers, and mixer/loader/applicators) were assessed with PHED data specific to liquid products since the WDGs are mixed into and applied as a liquid.

Mixer/Loaders:
(1) WDG: Aerial (Fixed Wing Airplane and Helicopter)
(2) WDG: Groundboom
(3) WDG: Right-of-Way Applications

Applicators:
(4) Liquid: Aerial Applications (Fixed Wing Airplane and Helicopter)
(5) Liquid: Groundboom Applications
(6) Liquid: Rights of Way Applications

Flaggers:
(7) Flagging for Aerial Sprays

Mixer/Loader/Applicators:
(8) Liquid: Low Pressure Handwand Sprayer

2.1.3 Sulfometuron methyl Handler Exposure/Risk Calculations

The daily exposure is the product of the amount of active ingredient (ai) handled per day and a unit exposure value. The amount of ai handled per day is the product of the application rate and the area treated. For example, if 0.188 lb ai/acre of sulfometuron methyl were applied to 1200 acres in one day, the amount of sulfometuron methyl handled that day would be 226 lbs. The unit exposure value is the amount of exposure that results from handling a given amount of active ingredient by a certain method while using certain PPE. For example, the dermal unit exposure value for open mixing and loading of granulars (WDG) with baseline PPE is 0.066 mg per pound of ai handled. In this example, the daily exposure would be 226 lbs ai handled multiplied by 0.066 mg unit

exposure per pound of ai handled which equals 15 mg per day. The daily absorbed dose (mg/kg body weight) is calculated from the exposure by multiplying the exposure by an absorption factor (1.0) and dividing the result by the body weight (70 kg). In this example the absorbed daily dose (ADD) would be (15 mg/day *1.0)/70 kg which would equal 0.21 mg/kg/day. The MOE is calculated by dividing the endpoint for the appropriate pathway (inhalation endpoint is a NOAEL = 27.5 mg/kg/day) by the ADD. For this example, the resulting MOE = 130 (rounded to 2 significant figures).

Daily dermal exposure is calculated**:**

Daily dermal exposure = Unit exposure x Application rate x Area Treated
(mg/day) (mg/lb ai) (lb ai/acre) (acres/day)

Where:

Unit exposure = normalized exposure value (mg exposure per pound ai handled) derived from PHED surrogate exposure data (Appendix A);
Application rate = normalized application rate based on a logical unit treatment such as acres, a maximum value is generally used (lb ai/acre); and
Area treated = normalized application area such as acres/day.

Daily inhalation unit exposure values were calculated for inclusion into the PHED surrogate exposure tables and presented as (µg/lb ai) based on a human inhalation rate of 29 L/minute and an 8-hour working day.

Daily inhalation exposure is calculated**:**

Daily inhalation exposure = [Unit exposure x Application rate x Area Treated] / Conversion Factor
(µg/kg/day) (lb ai/acre) (acres/day) (1 mg/1000 µg)

Where:

Unit exposure = normalized exposure value (µg/lb ai handled) derived from PHED;
Application rate = same as for dermal exposure (lb ai/acre); and
Daily treatment = same as for dermal exposure (acres/day).

Absorbed daily dermal and inhalation doses are then calculated by adjusting for dermal and inhalation absorption and normalizing by body weight. A body weight of 70 kg (average body weight) was used because the effects observed in the toxicology study were not gender specific.

ADD is calculated**:**

Absorbed daily dermal/inhalation dose = (Daily dermal/inhalation exposure x abs factor) /body weight
(mg/kg/day) (mg/day) (unitless) (kg)

[Note: an absorption factor of 1.0 was used for dermal and inhalation exposures.]

The level of concern for occupational handlers is defined by an MOE = 100. Exposure scenarios with estimated risk (MOEs) greater the level of concern (i.e., an MOE ≥ 100) do not indicate a risk of concern for the occupational population.

MOEs are calculated for each individual pathway (dermal, inhalation) using the MOE formula:

MOE (unitless) = NOAEL / ADD

Combined MOEs (dermal and inhalation) were calculated for sulfometuron methyl because common toxicity endpoints were used to calculate dermal and inhalation risks. The dermal and inhalation MOEs were combined using the formula below:

$$\text{Combined MOE} = \frac{1}{(1/\text{Dermal MOE}) + (1/\text{Inhalation MOE})}$$

2.1.4 Occupational Handler Exposure/Risk Estimates

Short- and intermediate-term dermal and inhalation exposures/risks were calculated for occupational handlers of sulfometuron methyl for different exposure scenarios. Most of the handler short- and intermediate-term scenarios assessed (dermal and inhalation combined) resulted in risk estimates (MOEs) ≥ 100 at some level of personal protection and, therefore, are not of concern. The exposure scenario mixing/loading of WDGs for aerial application to forestry and non-crop areas results in a combined MOE = 90 at the maximum level of personal protection (double layer with gloves) and, therefore, is of potential concern. A summary of risk calculations performed for occupational sulfometuron methyl handlers at baseline PPE is presented below in Table 4; a summary of calculations for occupational sulfometuron methyl handlers with additional PPE is presented in Table 5. (as mentioned previously, unit exposure values are provided in Appendix A).

Table 4. Sulfometuron Methyl MOEs Attributable to Short- and Intermediate-term Combined Dermal and Inhalation Occupational Exposure (Baseline PPE)[a]

No.	Scenario	Target	App. Rate[b] (lb ai/acre)	Area Treated (acres)	Dermal[c] MOEs	Inhalation[d] MOEs	Combined[e] MOEs
Mixer/Loaders							
1	WDGs: Aerial Equipment (Fixed Wing and Helicopter)	Forestry (Hardwoods, Conifers), Non-Crop Areas (Public, Private, Military Lands)	0.38	1200	65	5600	**64**
		Turf (Unimproved)	0.19		130	11000	130
		Non-Crop Land Restoration	0.09		260	22000	260
2	WDGs: Groundboom Equipment	Forestry (Hardwoods, Conifers), Non-Crop Areas	0.38	200	390	33000	380

Table 4. Sulfometuron Methyl MOEs Attributable to Short- and Intermediate-term Combined Dermal and Inhalation Occupational Exposure (Baseline PPE)[a]							
No.	**Scenario**	**Target**	**App. Rate[b] (lb ai/acre)**	**Area Treated (acres)**	**Dermal[c] MOEs**	**Inhalation[d] MOEs**	**Combined[e] MOEs**
		Turf (Unimproved)	0.19		780	66000	770
		Non-Crop Land Restoration	0.09		1500	130000	1500
3	WDGs: Rights-of-Way Equipment	Rights-of-Way, Non-Crop Areas	0.38	25	3100	270000	3100
		Turf (Unimproved)	0.19		6200	530000	6100
		Non-Crop Land Restoration	0.09		12000	1100000	12000
Applicators							
4	Liquids: Aerial Applications (Fixed Wing and Helicopter)	Forestry (Hardwoods, Conifers), Non-Crop Areas	0.38	1200	900	63000	840
		Turf (Unimproved)	0.19		1700	130000	1700
		Non-Crop Land Restoration	0.09		3400	250000	3400
5	Liquids: Groundboom Applications	Forestry (Hardwoods, Conifers), Non-Crop Areas	0.38	200	1800	35000	1700
		Turf (Unimproved)	0.19		3700	70000	3500
		Non-Crop Land Restoration	0.09		7300	140000	7000
6	Liquids: Rights-of-Way Applications	Rights-of-Way, Non-Crop Areas	0.38	25	160	53000	160
		Turf (Unimproved)	0.19		320	110000	310
		Non-Crop Land Restoration	0.09		630	210000	630
Flaggers							
7	Liquids: Aerial Sprays (Fixed Wing and Helicopter)	Forestry (Hardwoods, Conifers), Non-Crop Areas	0.38	350	1300	42000	1300
		Turf (Unimproved)	0.19		2700	84000	2600
		Non-Crop Land Restoration	0.09		5300	170000	5200
Mixer/Loader/Applicators							
8	Liquids: Low Pressure Handwand	Non-Crop Areas	0.38	1	51	170000	**51**
		Turf (Unimproved)	0.19		100	340000	100
		Non-Crop Land Restoration	0.09		210	680000	210

a Baseline = Long pants, long-sleeved shirt, no gloves
b Application rate based upon maximum labeled value.
c Dermal MOE = Dermal NOAEL (27.5 mg/kg/day)/ (Dermal Daily Dose [Reference W.Britton, 345025])
d Inhalation MOE = Inhalation NOAEL (27.5 mg/kg/day) / (Inhalation Daily Dose [Reference W.Britton, 345025])
e Combined MOE = 1/((1/Dermal MOE)+(1/Inhalation MOE))

Table 5. Sulfometuron Methyl MOEs Attributable to Short- and Intermediate-term Combined Dermal and Inhalation Occupational Exposure (Required Additional PPE)							
No.	**Scenario**	**Target**	**App. Rate[a] (lb ai/acre)**	**Area Treated (acres)**	**Dermal[b] MOEs**	**Inhalation[c] MOEs**	**Combined[d] MOEs**
Mixer/Loaders - Double Layer with Gloves Level of PPE							
1	WDGs: Aerial Equipment (Fixed Wing and Helicopter)	Forestry (Hardwoods, Conifers), Non-Crop Areas (Public, Private, Military Lands)	0.38	1200	91	5600	90
Mixer/Loader/Applicators - Single Layer with Gloves Level of PPE							
8	Liquids: Low Pressure Handwand	Non-Crop Areas	0.38	1	12000	170000	12000

a Application rate based upon maximum labeled value.
b Dermal MOE = Dermal NOAEL (27.5 mg/kg/day)/ (Dermal Daily Dose [Reference W.Britton, 345025])
c Inhalation MOE = Inhalation NOAEL (27.5 mg/kg/day) / (Inhalation Daily Dose [Reference W.Britton, 345025])
d Combined MOE = 1/((1/Dermal MOE)+(1/Inhalation MOE))

2.1.5 Risk Characterization

The occupational handler dermal exposure scenario is the only scenario for which significant risks were estimated for some uses; other risk assessments completed (e.g., chronic and acute drinking water) were not of concern. Due to a number of deficiencies identified in the conduct of the 21-day dermal study, it was deemed unsuitable for endpoint selection. In lieu of a route-specific study, the endpoint from the chronic oral toxicity study in dogs was used to estimate the potential for risk from dermal exposure to sulfometuron methyl. The Agency is confident that the use of the chronic oral study results in a health protective risk assessment for the following reasons:

- Although the 21-day dermal study had significant flaws, no toxicity was observed at 2000 mg/kg/day following 21 days of dosing;
- The results of the acute dermal toxicity study in rabbits shows an $LD_{50} \geq 2000$ mg/kg [Toxicity Category III]); and
- Dermal risks, which drive handler risks, were calculated assuming 100% dermal absorption due to lack of acceptable dermal absorption data. Assuming even a slightly lower dermal absorption of 90%, which is still likely to exceed the actual dermal absorption, would result in risk estimates which are not of concern for all scenarios, assuming some level of personal protective equipment is employed.

The exposure scenario mixing/loading of WDGs for aerial application to forestry and non-crop areas results in the lowest combined MOE = 90 at the maximum level of personal protection

(double layer with gloves). While this exposure scenario is of potential concern, this concern is significantly reduced because of the use of the conservative inputs described above.

2.2 Occupational Postapplication Exposure/Risks

HED uses the term "postapplication" to describe exposures to individuals that occur as a result of being in an environment that has been previously treated with a pesticide (also referred to as reentry exposure). HED believes that there are distinct job functions or tasks related to the kinds of activities that occur in previously treated areas. Job requirements (e.g., the kinds of jobs to cultivate a crop), the nature of the crop or target that was treated and how the chemical residues degrade in the environment can cause exposure levels to differ over time.

An assessment of occupational postapplication exposure to sulfometuron methyl was not performed. Since sulfometuron methyl is a non-selective herbicide used in non-agricultural areas, HED has determined that contact with previously treated areas is likely to be insignificant.

3.0 Residential Exposure/Risks

Residential exposure/risk (handler and postapplication) was not assessed since label instructions do not allow applications of sulfometuron methyl to residential or recreational settings.

References:

US EPA. 1998a. "PHED Surrogate Exposure Guide. Estimate of Worker Exposure from the Pesticide Handlers Exposure Database," Version 1.1. Science Advisory Council for Exposure, Office of Pesticide Programs. U.S. Environmental Protection Agency. Washington, DC. August, 1998.

US EPA, 2000. "Science Advisory Council for Exposure, Policy #: 9. Standard Values for Daily Acres Treated in Agriculture." Science Advisory Council for Exposure, Office of Pesticide Programs, U. S. Environmental Protection Agency, Washington, DC. July, 2000.

Appendix A: Occupational Handler Unit Exposure Data

Table A. Exposure Data Used for Occupational Handler/Applicator Risk Assessment (PHED Data)			
Exposure Scenarios	**Baseline Dermal (Single Layer Gloves) (mg/ lb ai)**	**Baseline Inhalation (No Respirator) (µg/ lb ai)**	**Dermal – Additional PPE (mg/ lb ai)**
Mixer Loader Unit Exposure Values			
WDGs: Aerial Equipment	0.066	0.77	0.047 (Double Layer with Gloves)
WDGs: Groundboom Equipment			NA
WDGs: Rights of Way Equipment			
Applicator Unit Exposure Values			
Liquids: Aerial Applications (Fixed Wing)	0.005	0.068	NA
Liquids: Groundboom Applications (Open Cab)	0.014	0.74	NA
Liquids: Rights of Way Equipment	1.3	3.9	NA
Flagger Unit Exposure Values			
Liquids: Aerial Sprays	0.011	0.35	NA
Mixer/Loader/Applicator Unit Exposure Values			
Liquids: Low Pressure Handwand	100	30	0.43 (Single Layer with Gloves)